

## PATENT ABSTRACTS OF JAPAN

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(54) POLYLACTIC ACID RESIN COMPOSITION, PRODUCTION METHOD THEREOF AND MOLDED ARTICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a polylactic acid resin composition forming a polylactic acid stereo complex having a high melting point, an efficient production method thereof and a molded article having good moldability.

SOLUTION: The polylactic acid resin composition is obtained by melting and mixing poly-L-lactic acid and poly-D-lactic acid, wherein a relationship between weight-average molecular weight Mw of poly-L-lactic acid and weight-average molecular weight Mw of poly-D-lactic acid satisfies the conditions:  $|Mw(A) - Mw(B)| \geq 50,000$ .

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to mold goods with the good moldability which consists of the polylactic resin constituent which has high-melting, its efficient manufacture approach, and said polylactic resin constituent.

[0002]

[Description of the Prior Art] Recently, from the standpoint of earth environmental preservation, the biodegradability polymer decomposed by operation of the microorganism which exists underwater under natural environment attracts attention among soil, and various biodegradability polymers are developed. As a biodegradability polymer in which melting shaping is [ among these ] possible, the aliphatic series polyester which consists of aliphatic series dicarboxylic acid components, such as for example, polyhydroxy butyrate, the poly caprolactone and a succinic acid, and an adipic acid, and glycol components, such as ethylene glycol and butanediol, polylactic acid, etc. are known.

[0003] Especially polylactic acid has comparatively cheap cost also in these, and since the melting point also has about 170 degrees C and the outstanding thermal resistance, it is expected as a biodegradability polymer in which melting shaping is possible. Moreover, by recently, since the lactic acid which is a monomer comes to be cheaply manufactured by the bacterial coupling using a microorganism and polylactic acid can be further produced by low cost, the use as a general-purpose polymer has also come to be considered only as a biodegradability polymer.

[0004] Furthermore, by mixing Polly L-lactic acid (Following PLLA being called) and a Polly D-lactic acid (Following PDLA being called) in the state of a solution, it is known that polylactic acid stereo complex will be obtained and these are indicated by JP,63-241024,A and Macromolecules, 24, 5651 (1991), etc. And polylactic acid stereo complex shows high-melting and high crystallinity, and giving mold goods useful as fiber, a film, and resin mold goods is known.

[0005] In case polylactic acid stereo complex is used as mold goods, in order to attain the practical reinforcement as mold goods, it is desirable to use the polylactic acid stereo complex of the amount of macromolecules as much as possible.

[0006] However, in the polylactic acid stereo complex production approach in a solution condition, it is especially indicated for each molecular weight of PLLA and PDLA by Above Macromolecules, and 24 and 5651 (1991) from the combination of the 100,000 or more amount polylactic acid of macromolecules the amount of macromolecules and that polylactic acid stereo complex is hard to be obtained. both [ namely, ] PLLA and PDLA -- although -- in order to obtain polylactic acid stereo complex from the combination which is the amount of macromolecules, when mixing in the state of a solution, the mixed solution needed to be held over the long period of time, about [ that a problem is in productivity since the stroke which volatilizes a solvent further is also needed ], and a production process became complicated, and there was a problem of leading to a cost rise.

[0007] Moreover, in the polylactic acid stereo complex production approach by solution mixing, it is indicated by above-mentioned JP,63-241024,A and Above Macromolecules, and 24 and 5651 (1991)

from the combination from which each molecular weight of PLLA and PDLA differs that polylactic acid stereo complex is obtained.

[0008] Furthermore, it is indicated by Above Macromolecules, and 24 and 5651 (1991) that there is that [ no ] in which the polylactic acid stereo complex from combination whose either is the amount of macromolecules, and whose another side is low molecular weight as a combination of PLLA and PDLA is easy to be obtained, the polylactic acid stereo complex where the ratio of the molecular weight of PLLA and PDLA is perfect especially from 45 or more combination is obtained, and PLLA or PDLA remains as a respectively independent crystal.

[0009] However, from 13 or less combination, although polylactic acid stereo complex is obtained, the ratio of molecular weight will not have resulted, by the time it obtains the polylactic acid stereo complex which has high-melting [ perfect ], since a part remains as a crystal with respectively independent PLLA or PDLA.

[0010] Moreover, in the approach of the conventional technique mentioned above, since each was mixing in the solution condition, the solvent needed to be volatilized after mixing and there was also a problem that a production process became complicated and led to a cost rise.

[0011]

[Problem(s) to be Solved by the Invention] The place which this invention is attained as a result of considering solution of the trouble in the conventional technique mentioned above as a technical problem, and is made into the purpose is to offer mold goods with the good moldability which consists of the polylactic resin constituent which forms the polylactic acid stereo complex which has high-melting, its efficient manufacture approach, and said polylactic resin constituent.

[0012]

[Means for Solving the Problem] this invention persons result in a header and this invention that the polylactic resin constituent with which it is the polylactic resin constituent which comes to carry out melting mixing of Polly L-lactic acid and the Polly D-lactic acid, and the relation between the weight average molecular weight Mw of Polly L-lactic acid (A) and the weight average molecular weight Mw of a Polly D-lactic acid (B) fills specific conditions forms easily the polylactic acid stereo complex which has high-melting, as a result of inquiring wholeheartedly that the above-mentioned purpose should be attained.

[0013] namely, the polylactic resin constituent with which the polylactic resin constituent of this invention comes to carry out melting mixing of Polly L-lactic acid and the Polly D-lactic acid -- it is -- the relation between the weight average molecular weight Mw of said Polly L-lactic acid (A), and the weight average molecular weight Mw of said Polly D-lactic acid (B) --  $|Mw(A)-Mw(B)| \geq$  -- it is characterized by fulfilling the conditions of 50,000.

[0014] In addition, it sets to the polylactic resin constituent of this invention. About the weight average molecular weight Mw of said Polly L-lactic acid (A), and the weight average molecular weight Mw of said Polly D-lactic acid (B), Mw [ Mw (A)/Mw (B) or ] (B)/Mw (A) either A large value is three or more, It is mentioned as desirable conditions each of that one [ at least ] weight average molecular weight is 350,000 or less among that the weight average molecular weight of a polylactic resin constituent is 100,000 or more, and said Polly L-lactic acid above and a Polly D-lactic acid.

[0015] Moreover, after the manufacture approach of the polylactic resin constituent of this invention carries out melting mixing after carrying out the dryblend of said Polly L-lactic acid and said Polly D-lactic acid beforehand, or it carries out melting of either said Polly L-lactic acid or said Polly D-lactic acid, it is characterized by remaining, while in addition mixing.

[0016] Furthermore, it is characterized by the mold goods of this invention coming to fabricate the polylactic resin constituent obtained from the above-mentioned polylactic resin constituent or the above-mentioned manufacture approach.

[0017]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail.

[0018] The polylactic resin constituent of this invention is a polylactic resin constituent which comes to carry out melting mixing of Polly L-lactic acid and the Polly D-lactic acid.

[0019] this invention -- setting -- the relation between the weight average molecular weight  $M_w$  of Polly L-lactic acid (A), and the weight average molecular weight  $M_w$  of a Polly D-lactic acid (B) --  $|M_w(A) - M_w(B)| \geq$  -- it is what fulfills the conditions of 50,000 -- desirable -- especially --  $|M_w(A) - M_w(B)| \geq$  -- it is desirable that it is especially what fulfills the conditions of 100,000.  $|M_w(A) - M_w(B)| <$  -- since high-melting polylactic acid stereo complex becomes is it hard to be formed to be the conditions of 50,000, it is not desirable.

[0020] In this invention, about the weight average molecular weight  $M_w$  of Polly L-lactic acid (A), and the weight average molecular weight  $M_w$  of a Polly D-lactic acid (B), it is desirable that any of  $M_w$  [  $M_w(A)/M_w(B)$  or ]  $(B)/M_w(A)$  or a large value is three or more, and it is more desirable that it is further four or more. The inclination as for which the amount of macromolecules and high-melting polylactic acid stereo complex become is it hard to be formed that any of  $M_w$  [  $M_w(A)/M_w(B)$  or ]  $(B)/M_w(A)$  or a large value is less than three is produced.

[0021] In this invention, although especially the weight average molecular weight of a polylactic resin constituent is not limited, it is desirable that it is 100,000 or more at the point that the polylactic acid stereo complex which has good machine physical properties is obtained. Especially, it is more desirable that it is [ or more 100,000 ] 1,200,000 or less in respect of a moldability and machine physical properties.

[0022] In this invention, it is desirable that one [ at least ] weight average molecular weight is 350,000 or less among Polly L-lactic acid and a Polly D-lactic acid, and it is more desirable that it is further 300,000 or less. if one [ at least ] weight average molecular weight exceeds 350,000 among Polly L-lactic acid and a Polly D-lactic acid -- the melting point of polylactic acid stereo complex -- low -- \*\* -- it is in an inclination.

[0023] In addition, in this invention, weight average molecular weight is the value of the weight average molecular weight of the standard polymethylmethacrylate conversion by the gel-permeation-chromatography (GPC) measurement using hexafluoro isopropanol as a solvent.

[0024] In this invention, although especially the mixed weight ratio of Polly L-lactic acid and a Polly D-lactic acid is not limited, it is desirable that it is 90:10-10:90, it is more desirable that it is 75:25-25:75, and it is desirable that it is especially 60:40-40:60. \*\* which produces the inclination which will stop being able to form polylactic acid stereo complex easily by the rise of the melting point of the polylactic resin constituent obtained becoming small if the mixed weight ratio of Polly L-lactic acid and a Polly D-lactic acid exceeds less than 10 weight and 90 weight, respectively.

[0025] In this invention, a polylactic resin constituent forms polylactic acid stereo complex. Polylactic acid stereo complex is made high-melting, as the temperature requirement, 190 degrees C or more are desirable, and it is [ it is more desirable that it is 200 more degrees C or more and ] more desirable than Polly L-lactic acid or a Polly D-lactic acid that it is especially 210 degrees C or more.

[0026] Although Polly L-lactic acid is a polymer which makes L-lactic acid a main constituent in this invention and a Polly D-lactic acid is a polymer which makes D-lactic acid a main constituent In order to obtain the polylactic resin constituent which forms the polylactic acid stereo complex which has high-melting The one where the optical purity of each lactic-acid component of Polly L-lactic acid or a Polly D-lactic acid is higher is desirable. the inside of each total lactic-acid component, L bodies, or D object - - more than 80 mol % -- being contained -- desirable -- further -- more than 90 mol % -- being contained -- desirable -- more than 95 mol % -- especially the thing included is desirable.

[0027] In this invention, copolymerization components other than each main constituent may be included in the range which does not spoil the purpose of this invention.

[0028] As other copolymerization component units, a multiple-valued carboxylic acid, polyhydric alcohol, hydroxycarboxylic acid, lactone, etc. are mentioned, for example. Specifically Oxalic acid, a malonic acid, a succinic acid, a glutaric acid, an adipic acid, an azelaic acid, A sebacic acid, a dodecane dione acid, a fumaric acid, cyclohexane dicarboxylic acid, A terephthalic acid, isophthalic acid, a phthalic acid, 2, 6-naphthalene dicarboxylic acid, Multiple-valued carboxylic acids, such as 5-sodium sulfoisophtharate and 5-tetrabutylphosphoniumsulfoisophthalic acid Ethylene glycol, propylene glycol, butanediol, heptane diol, Hexandiol, octanediol, nonane diol, the Deccan diol, 1, 4-cyclohexane

dimethanol, neopentyl glycol, a glycerol, Trimethylol propane, pentaerythritol, bisphenol A, The aromatic series polyhydric alcohol which carried out the addition reaction of the ethylene oxide to the bisphenol, A diethylene glycol, triethylene glycol, a polyethylene glycol, Polyhydric alcohol, such as a polypropylene glycol and a polytetramethylene glycol A glycolic acid, 3-hydroxybutyric acid, 4-hydroxybutyrate, a 4-hydroxy valeric acid, Hydroxycarboxylic acid, such as a 6-hydroxy caproic acid and a hydroxybenzoic acid And glycolide, epsilon-caprolactone glycolide, epsilon-caprolactone, Beta propiolactone, delta-butyrolactone, beta-, or gamma-butyrolactone, Lactone, such as PIBARO lactone and delta-valerolactone, is mentioned, besides it, D-lactic acid may be included in Polly L-lactic acid, and L-lactic acid may be included in the Polly D-lactic acid.

[0029] In this invention, especially as an approach of manufacturing Polly L-lactic acid or a Polly D-lactic acid, it is not limited but the manufacture approach of common polylactic acid can be used. L-lactide or D-lactide which is an annular dimer is made to specifically generate once by using L-lactic acid or D-lactic acid as a raw material, the direct polymerization method of the single step which performs direct dehydration condensation in a solvent etc. is learned after that in two steps of the lactide methods for performing ring opening polymerization, and the raw material concerned, and which process may be used.

[0030] Moreover, polymerization time amount can be shortened by using a catalyst for a polymerization reaction. As a catalyst, metals, such as tin, zinc, lead, titanium, a bismuth, a zirconium, germanium, antimony, and aluminum, and the derivative of those are mentioned, for example.

[0031] As a derivative, a metal alkoxide, carboxylate, a carbonate, an oxide, and a halogenide are desirable. Specifically, chlorination tin, tin octylate, a zinc chloride, zinc acetate, a lead oxide, lead carbonate, a titanium chloride, alkoxy titanium, a germanium dioxide, a zirconium dioxide, etc. are mentioned. Also in these, a tin compound is desirable and especially tin octylate is more desirable.

[0032] Although especially the addition of a catalyst is not limited, its 0.001 - 2 weight section is desirable to the raw material (L-lactic acid, D-lactic-acid, L-lactide, or D-lactide) 100 weight section to be used, and its 0.001 - 1 weight section is more desirable especially. If the compaction effectiveness of polymerization time amount falls under in the 0.001 weight section and the amount of catalysts exceeds 2 weight sections, it will become the inclination for the polymer which has sufficient weight average molecular weight to form the polylactic acid stereo complex which has good machine physical properties to be hard to be obtained.

[0033] The polylactic resin constituent of this invention is manufactured by carrying out melting mixing of Polly L-lactic acid and the Polly D-lactic acid. Although especially the approach of melting mixing is not limited, after carrying out melting of either the approach of carrying out melting mixing, for example after carrying out the dryblend of Polly L-lactic acid and the Polly D-lactic acid beforehand, Polly L-lactic acid or a Polly D-lactic acid, the approach of remaining, while in addition mixing etc. is mentioned.

[0034] although especially a mixed container is not what is limited in case the polylactic resin constituent of this invention is manufactured -- a mixing vessel mold mixer, a mixer mold mixer, and a column -- a type mixer, an extruder mold mixer, etc. -- it can use -- inside -- an extruder mold mixer -- desirable -- more -- desirable -- the extruder mold mixer of a monopodium or two shafts -- the extruder mold mixer of two shafts is used especially preferably. Moreover, it can be used for two or more sorts of said mixed container, combining.

[0035] Although especially the temperature at the time of manufacturing the polylactic resin constituent of this invention is not limited, it is desirable that it is in the range of 150 degrees C or more and 270 degrees C or less, and it is more desirable that it is in the range of 180 degrees C or more and 250 degrees C or less especially. In addition, although it is desirable to carry out melting above each melting point in order to carry out melting of Polly L-lactic acid and the Polly D-lactic acid, it is desirable to lower temperature to extent in which melting mixture does not solidify as much as possible, and to perform melting mixing in that a decomposition reaction is controlled.

[0036] Although especially the pressure at the time of manufacturing the polylactic resin constituent of this invention is not limited and can be applied also on condition that any of ordinary pressure and

reduced pressure, it is desirable to carry out on reduced pressure conditions in that the monomer which carries out decomposition generation can be removed during melting mixing.

[0037] In the polylactic resin constituent of this invention, one sort, such as a coloring agent containing an additive, for example, an ultraviolet ray absorbent, a thermostabilizer, lubricant, a \*\* form agent, a usual color, and a usual pigment, or two sorts or more can be added in the range which does not spoil the purpose of this invention.

[0038] The polylactic resin constituent obtained from the polylactic resin constituent of this invention and the manufacture approach of this invention can be widely used as mold goods. Mold goods are a film, a sheet, fiber and cloth, a nonwoven fabric, an injection-molded product, an extrusion-molding article, vacuum pressure sky mold goods, a blow molding article, complex with other ingredients, etc., and it is useful as an application of the materials for agriculture, the materials for horticulture, the materials for fishings, engineering works and structural materials, stationery, medical supplies, or others.

[0039]

[Example] Hereafter, an example explains this invention concretely. Here, number of copies in an example shows the weight section.

(1) It is the value of the weight average molecular weight of the standard polymethylmethacrylate conversion measured with gel permeation chromatography (GPC) as the weight-average-molecular-weight above-mentioned was carried out. GPC measurement uses the WATERS differential refractometer WATERS410 for a detector, uses MODEL510 high performance chromatography for a pump, and is ShodexGPC to a column. HFIP-806M and Shodex GPC HFIP-LG was performed using the thing linked to a serial. The Measuring condition was made into rate-of-flow 0.5 mL/min, used hexafluoro isopropanol for the solvent and carried out 0.1mL impregnation of the solution of sample concentration 1 mg/mL.

(2) It is the value measured with the melting point differential scanning calorimeter (DSC), and a Measuring condition is a part for 10mg [ of samples ], nitrogen-gas-atmosphere mind Shimonaka, and programming-rate/of 20 degrees C. Formation of polylactic acid stereo complex was judged by high-melting-ization. Moreover, the amount of formation of polylactic acid stereo complex was judged with the magnitude of crystal fusion enthalpy. That is, it was made high-melting, and when crystal fusion enthalpy was 10J/g - 20 J/g (the melting point peak of this range is set to MP), there were many amounts of formation of polylactic acid stereo complex, and when it was 20 more or more (the melting point peak of this range is set to LP) J/g, it was judged that there were especially many amounts of formation of polylactic acid stereo complex.

[0040] On the other hand, it was judged that the amount of formation of polylactic acid stereo complex had little it if crystal fusion enthalpy is the peak (the melting point peak of this range is set to SP) of 5 or less J/g, and polylactic acid stereo complex was not substantially formed even if it makes it high-melting.

(3) It judged by whether press forming of the moldability polylactic resin constituent is carried out for 3 minutes at 250 degrees C, and the film whose thickness is about 0.05mm is obtained. That is, when obtained as a film of one sheet, it considered as O, and when a film was not obtained but only a fine fragment was obtained, it considered as x.

[0041] [Example 1 of reference] Polly L-lactic acid (A-1) L-lactide After dissolving in the bottom of nitrogen-gas-atmosphere mind in the reaction container which churning equipment attached and dissolving the 50 sections in homogeneity at 120 degrees C, temperature is made into 140 degrees C, and it is tin octylate. The polymerization reaction was carried out for 1 hour, after adding the 0.05 sections. Dissolved the reactant in chloroform after polymerization reaction termination, and it was made to precipitate, agitating in a methanol (the amount of 10 times of chloroform), the monomer was removed completely, and Polly L-lactic acid (A-1) was obtained.

(A-2 to A-3) Except having set up the amount and polymerization reaction time of tin octylate, as shown in Table 1, it carried out like (A-1) and Polly L-lactic acid (A-2 to A-3) was obtained.

[0042] Except having set up the amount and polymerization reaction time of \*\* for D-lactides, and tin

octylate instead of the [example 2 of reference] Polly D-lactic-acid (B-1 to B-3) L-lactide, as shown in Table 1, it carried out like (A-1) and the Polly D-lactic acid (B-1 to B-3) was obtained.

[0043] About the polymer obtained, respectively, the result of GPC measurement and DSC measurement is shown in Table 1.

[0044]

[Table 1]

		ポリ-L-乳酸			ポリ-D-乳酸		
		A-1	A-2	A-3	B-1	B-2	B-3
オクチル酸錫	部	0.05	0.05	0.10	0.10	0.05	0.05
重合反応時間	h	1.0	1.5	2.0	0.5	1.4	1.8
重量平均分子量	$\times 10^{-3}$	10	20	16	4	16	39
融点	℃	168	173	171	164	170	176

After carrying out dryblend beforehand in the combination which shows the polymer shown in the [examples 1-4] table 1 in Table 2, respectively, melting mixing was carried out at 250 degrees C using 1 shaft extruder.

[0045] After dissolving in the bottom of nitrogen-gas-atmosphere mind in the reaction container which churning equipment attached and dissolving the [example 5] polymer A-2 in homogeneity at 250 degrees C, the polymer B-1 was added, and it agitated for 15 minutes, and agitated at 100 degrees C after that for 10 minutes.

It used in the combination which shows the polymer shown in the [examples 1-2 of comparison] table 1 in Table 2, respectively. After dissolving each polymer by the concentration of 1g/100mL as a mixed approach, using chloroform as a solvent, it mixed and agitated for 15 minutes. Mixed liquor was left in the room temperature for 12 hours, the solvent was volatilized, and it was made to dry with a vacuum dryer further for 12 hours.

After carrying out dryblend beforehand in the combination which shows the polymer shown in the [examples 3-4 of comparison] table 1 in Table 2, respectively, melting mixing was carried out at 250 degrees C using 1 shaft extruder.

[0046] About the polylactic resin constituent obtained, respectively, the result of GPC measurement, DSC measurement, and a moldability is shown in Table 2.

[0047]

[Table 2]

【表2】

混合条件	表1例1		表2例2		表3例3		表4例4		表5例5		比較例1		比較例2		比較例3		比較例4	
	混合比 <sup>*1</sup>	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1	溶融1
混合比	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1	A-1/B-1
重量平均分子量	$\times 10^{-4}$	10/4	10/16	10/16	10/39	10/39	20/4	20/4	20/4	20/4	10/16	20/4	20/4	20/4	16/16	20/16	20/16	20/16
分子重量 <sup>*2</sup>	$\times 10^{-4}$	6	6	6	28	28	16	16	16	16	9	16	16	16	0	4	4	4
分子重量比 <sup>*3</sup>		2.5	1.6	1.6	3.9	3.9	5.0	5.0	5.0	5.0	1.6	5.0	5.0	5.0	1.0	1.25	1.25	1.25
混合重量比		50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
融点	LP <sup>*4</sup>	225	224	224	215	215	227	227	227	227	168	169	169	169	168	169	169	169
	MP <sup>*5</sup>																	
	SP <sup>*6</sup>																	
重量平均分子量	$\times 10^{-4}$	6	12	12	23	23	11	11	11	11	13	12	12	12	15	17	17	17
成形性 <sup>*7</sup>		x	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

\*1: 溶融1:ポリ-L-乳酸とポリ-D-乳酸を同時に溶融混合した。

溶融2:ポリ-L-乳酸を溶融した後、ポリ-D-乳酸を加えて溶融混合した。

溶融: 溶融混合した。

\*2:  $|Mw(A) - Mw(B)|$ \*3:  $Mw(A)/Mw(B)$ または $Mw(B)/Mw(A)$ のいずれか大きい値

\*4: LPは、ポリマー融点ピークの内、結晶融解エンタルピーが20J/g以上の融点ピーク

\*5: MPは、ポリマー融点ピークの内、結晶融解エンタルピーが10~20J/gの融点ピーク

\*6: SPは、ポリマー融点ピークの内、結晶融解エンタルピーが5J/g以下の融点ピーク

\*7: フィルムが得られる場合は○、フィルムが得られず破片のみ得られる場合は×

Examples 1-5 show that the peak 200 degrees C or more made high-melting is observed as an LP, and, as for the polylactic resin constituent of this invention, forms polylactic acid stereo complex easily.

[0048] On the other hand, as shown in the examples 1-2 of a comparison, by the approach by solution mixing, the peak made high-melting was observed as an SP, it is a request and most polylactic acid stereo complex was not formed.

[0049] The comparison of examples 1-5 and the examples 3-4 of a comparison shows forming the perfect polylactic acid stereo complex where gay polylactic acid does not exist when the ratio of each weight average molecular weight of the comparison of examples 1-2 and an example 4 to the Polly L-lactic acid with which it turns out that polylactic acid stereo complex is easily formed when the difference of each weight average molecular weight of Polly L-lactic acid and a Polly D-lactic acid is 50,000 or more, and a Polly D-lactic acid is three or more.

[0050] From the comparison of an example 1 and examples 2-4, when the weight average molecular

weight of a polylactic resin constituent is 100,000 or more shows that a moldability is good.

[0051] From the comparison of an example 3 and an example 4, when one [ at least ] weight average molecular weight is 350,000 or less among Polly L-lactic acid and a Polly D-lactic acid shows forming perfect polylactic acid stereo complex in high-melting.

[0052] As shown in examples 4-5, also in which melting mixing approach, it turns out that polylactic acid stereo complex is formed.

[0053] Examples 2-5 show that mold goods with a good moldability are obtained from the polylactic resin constituent of this invention.

[0054]

[Effect of the Invention] the polylactic resin constituent which comes to carry out melting mixing of Polly L-lactic acid and the Polly D-lactic acid according to this invention -- it is -- the relation between the weight average molecular weight Mw of Polly L-lactic acid (A), and the weight average molecular weight Mw of a Polly D-lactic acid (B) --  $|Mw(A)-Mw(B)| \geq$  -- the polylactic resin constituent which forms the polylactic acid stereo complex which has high-melting effectively with the polylactic resin constituent which fulfills the conditions of 50,000 can be obtained. Moreover, this polylactic resin constituent can be efficiently manufactured by melting mixing, and mold goods with a still better moldability can be offered.

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[Translation done.]